REMARKS

General:

Claims 43-62 are pending in the application. An obvious error in the dependency of claims 56 and 62 has been corrected. No new matter has been added by this amendment.

35 U.S.C. § 102:

Claims 43-48, 50, 54-62 were rejected as anticipated by U.S. Patent no. 4,506,223 (Bottomley). The rejection is traversed. Bottomley does not disclose or suggest, and is not alleged to disclose or suggest, all the features of any of the rejected claims.

Bottomley describes an essentially conventional NMR machine, with a DC B_0 field coil, three DC gradient (G_x, G_y, and G_z) coils, perpendicular to each other and with the G_z gradient field parallel to the B_0 field, and an RF coil typically parallel to the G_x gradient coil. There is no suggestion that Bottomley's device would, or even could, produce the specific rapidly-varying resultant fields recited in the present claims. Since Bottomley's NMR device is intended to observe a sample, there is a presumption that it would not be desirable to alter the sample, so it would not be obvious to modify Bottomley's device so as to produce the specific rapidly-varying resultant fields recited in the present claims, the specific purpose of which is to induce a stereochemical deformation for the purpose of altering properties of a material exposed to the field.

In more detail:

The Office action states that "Bottomley discloses a method for chemical shift imaging (stereochemical deformation) using NMR (see title)." The words "stereochemical deformation" do not appear in Bottomley. As is explained in Bottomley, see col. 1, lines 20-44, "chemical shift" is a phenomenon by which a particular electron distribution partially shields a nucleus from the applied static field B_0, and the resulting change in the apparent field strength at the nucleus causes a distinctive shift in the Larmor frequency ω. Only the frequency changes. There is no stereochemical deformation.

The Office action states that in Bottomley "one of the pairs [of coils 300 and 302] rotates 90 degrees relative to the other pair (see Fig. 7a; col. 12, ln. 42-58)." It can only be supposed that is a misreading of the statement at col. 12, lines 47-50, that the "coil sets for producing gradient G_y are rotated 90° around the cylindrical axis 104 (FIG. 1) of the sample chamber relative to the coil that produces gradient G_x." As a matter of linguistic usage, it is respectfully pointed out that participial adjectives are commonly used in English to describe a state, without implying a process requiring the action of the verb to reach that state. For example, an "elongated" object should be long and thin, but "elongated" does not normally imply the object was formed by elongating a shorter, fatter precursor. Similarly, "rotated 90°" requires that the coils be 90° apart, but does not imply that they were positioned by an act of rotating, still less that they could rotate in use. As a matter of geometry, Bottomley explicitly states (col. 4, line 21) that he is using a Cartesian coordinate system. That necessarily requires the x and y axes, and therefore the G_x and G_y coils, are in a fixed relationship at 90° to one another. There are no rotating coils.

The Office action states that in Bottomley the "amplitudes of the magnetic fields are gradients (see abstract) meeting the requirement of the presently claimed invention." Absent any indication which requirement of which of the eighteen rejected claims this feature is supposed to meet, the statement that "amplitudes are gradients" is not understood. Bottomley's gradients G_x, G_y, G_z are in fact uniform quantities, representing a gradient in the B_0 field. Each of the gradients is produced by a gradient field b_x, b_y, b_z that varies linearly in one direction across the sample volume. See col. 4, lines 36-56. The gradients, and therefore the gradient fields, are time dependent. However, since the purpose of the variation is to produce spatial localization, col. 4, lines 33-36, the gradient fields must be essentially constant within each pulse sequence. In fact, FIGS. 2-4 of Bottomley show pulses that have a "programmable amplitude" but within each pulse sequence the gradient pulses are variable only because they begin and end, and the different gradient fields are switched on and off in synchrony. There is nothing in Bottomley's gradient fields that could produce a resultant field with the combinations of variable amplitude and variable angular

velocity recited in applicant's claims. It is not clear how Bottomley's gradient fields support the Office's position.

The Office action states that Bottomley's "process uses selective RF pulses having variable frequency that is 90 degrees (see col. 4, ln. 57-63)." In fact, the cited passage from Bottomley describes RF pulses having a frequency fixed by Equation (1), see col. 4, lines 60-62. (Presumably different frequencies could be used for different pulse sequences, but that would not support the Office's position.) The only reference in the cited passage to "90 degrees" is in the expression "90° RF pulse," which Bottomley defines as a pulse sufficient (in duration) to rotate the nuclear magnetic moment through 90°.

Bottomley does not disclose or suggest, and the Office action does not even appear to allege that Bottomley discloses or suggests, the specific variations in the magnetic fields recited in independent claims 43, 54, 57, and 60, and those claims are therefore deemed to be not only novel but also non-obvious over Bottomley.

Claims 44-48, 50, 55-56, 58-59, and 61-62 are dependent from claims 43, 54, 57, and 60, and without prejudice to their individual merits are deemed to be novel and non-obvious over Bottomley for at least the same reasons as their respective base claims.

In addition, however, Bottomley does not disclose or suggest two AC currents, so cannot disclose or suggest currents with a specified phase shift (**claim 44**) or different frequencies (**claims 45 and 58**).

Bottomley does not appear to disclose coils inside the pipe (**claim 47**). No rejection of claim 47 complying with 37 C.F.R. § 104(b)(2) is presented.

The statement that as "shown in Fig. 7a [of Bottomley], it appears that the magnetic field plane forms an angle between the presently claimed range" may have been directed at **claims 48, 56, 59, and 62**. However, without any indication of which two of the (typically five) distinct fields in Bottomley the Office is relying on as defining a field plane, or where the direction of flow of a fluid is supposed to be, a field plane "at an angle of between 45° and 90°" with the sample tube, a rejection complying with 37 C.F.R. § 104(b)(2) cannot be recognized.

Indeed, more generally, there is no suggestion in Bottomley that the sample could be a flowing liquid, as required by **claims 48, 55, 56, 59, 61, and 62**.

For these reasons also, at least claims 44, 45, 47, 48, 55, 56, 58, 59, 61, and 62 are deemed to be novel and non-obvious over Bottomley.

35 U.S.C. § 103:

Claims 49 and 51-53 were rejected as obvious over Bottomley in view of U.S. Patent No. 3,551,794 (Vander Heyden). The rejection is traversed.

Claims 49 and 51-53 are dependent from claim 43, and Vander Heyden is relied on only for the additional features of dependent claim 49. Claims 49 and 51-53 are therefore deemed to be novel and non-obvious over the combination of Vander Heyden and Bottomley for at least the same reasons as claim 43 is novel and non-obvious over Bottomley alone.

In addition, Vander Heyden does not show or suggest, and is not alleged to show or suggest, the features recited in at least claims 51-53. For these reasons also, claims 51-53 are deemed to be novel and non-obvious.

Conclusion:

In view of the foregoing, all of pending claims 43-62, as now presented, are believed to be novel and non-obvious over the cited prior art. Reconsideration of the examiner's rejections and an early notice of allowance of claims 43-62 are earnestly solicited.

If the examiner believes that direct communication with the applicant's representatives will be helpful, she is respectfully invited to contact Henry Blanco White (Reg. No. 47,350) at telephone no. 215-988-3301.

Respectfully submitted

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